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EXAMINER	
OLSEN, LIN B	

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3609	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/809,351	KIM ET AL.	
	Examiner	Art Unit	
	Lin B. Olsen	3609	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3,5-21 and 23* is/are rejected.

7)☒ Claim(s) *2,4 and 22* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *25 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Priority

Acknowledgment is made of applicant's claim for foreign priority based on application filed in Korea on August 4, 2003. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

DETAILED ACTION

Specification

The disclosure is objected to because of the following informalities: Drawings 6a, 6b, 7a, and 7b are not described or referred to in the specification. Appropriate Correction is required.

Claim Objections

Claim 8 is objected to because of the following informalities: The claim recites "the displacement of the mobile robot" in line 2. There is insufficient antecedent basis for this limitation in the claim. Prior claims do not mention movement of the robot. Appropriate correction is required.

Claim 9 is objected to because of the following informalities: The claim recites "the rotation driving part outputs information" in lines 1 and 2. The rotation driving part

is not shown having any outputs. It appears that the claim should read "the **encoder** outputs" and the claim will be examined in this manner. Appropriate correction is required.

Claim 11 is objected to because of the following informalities: The claim recites "beacon information" in line 2. There is insufficient antecedent basis for this limitation in the claim. It appears that claim 11 should be dependent on claim 15 and the claim will be examined in this manner. Appropriate correction is required.

Claim 16 is objected to because of the following informalities: The claim recites in line 2 a "plurality of beacons", whereas it recites in line 3 "the beacon". It is unclear how to interpret this language. The claim will be examined interpreting line 3 as reciting "at least one transmitter provided to each of the plurality of beacons to transmit light..." Appropriate correction is required.

Claim 22 is objected to because of the following informalities: The claim is dependent on claim 19 and recites "double sides of the mirror". There is insufficient antecedent basis for this limitation in the claim. Appropriate correction in required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 13 and 14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 13 is rejected because the claim is dependent on claim 1 and recites in line 3, "at least one transmitter", whereas claim 1 recites "a transmitting part". There is insufficient antecedent basis for the limitation in the claim. Further, the relationship between the "rotation driving part and the double sided mirror/ transmitter is unclear. Appropriate correction is required.

Claim 14 is rejected because the claim is dependent on claim 5 that recites "at least one receiver". Claim 14 recites "the receiver". There is insufficient antecedent basis for this limitation in the claim. Further, the receiver comprises "a conical mirror" which is unclear. Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 5, 7, 9-11, 15-20, and 23 are rejected under 35 U.S.C. 102(b) as being anticipated by Halsall et al. U. S. Patent No. 4,309,758 (hereafter referenced as Halsall).

Halsall discloses an autonomous vehicle (a robot) that is guided using light sensitive detectors that respond to light transmitted by fixed beacons that transmit beacon indicia and coded information concerning the direction of the beam with respect to a fixed axis (col 1 lines 14-31, lines 44-47). The beam rotates about a vertical axis

and the character of the rotating beam is changed such as by frequency modulation or time base of pulsation as the beam sweeps around the axis (col 1 lines 60-65) and thereby traverses a circle of compass points.

In Halsall, a specific form of phase encoding is described. This encoding uses a gray code to specify the unique pattern of binary bits used to provide coded data corresponding to the location of the beacon and the direction of the beam of light emitted therefrom. (col 7, lines 27 to col 8, line 3). The coding is carried in pulse modulated form (col 2, lines 49-56). This corresponds to applicant's phase encoding by "PWM (pulse width modulation)".

Regarding **claim 1,** in figures 3 and 4, Halsall discloses a collimated light source 29, "a beacon", coupled by mechanical couplings 30 to a stepping motor 31, "a rotation driving part". A light source modulator 33, "an encoder", has inputs coding the angular direction and the beacon location. The output of modulator 33 is fed to the light source 29, "a transmitting part", to provide a coded message (frequency modulation, etc) corresponding to the location of the beacon and the direction of the beam of light emitted therefrom. This reads on a "beacon" comprising a "rotation driving part" to rotate a "transmitting part" and an "encoder to add phase information" regarding "rotation of the transmitting part to the light". Further, Halsall discloses in col. 1 lines 14-30 a roving automatic vehicle "a robot" guided by on-board light sensitive detector(s) "a receiving part" and a computer capable of interpreting the information from the detectors relating to the position of each fixed station to determine the location of the automatic vehicle, col 1 lines 47-52. Which reads on "mobile robot" comprising a "location determiner" that

determines the location of the mobile robot based on the "phase information of the light received by the receiving part". Figure 4 further illustrates the computation conducted in Halsall and corresponds to Figure 3 in the application, which illustrates the computations by the location determiner.

Regarding **claim 5,** figure 1 illustrates three receivers 12 on the vehicle which read on "the receiving part further comprising: at least one receiver to receive the light transmitted from the transmitting part".

Regarding **claim 7,** figure 3 and col. 7 lines 27-42 disclose preset map reference information fed into the light source modulator 33 which reads on "the beacon has inherent beacon information" and light source modulator 33 incorporates the gray code angular direction information and present map reference information onto the signal that modulates the rotating light source by means such as frequency modulation. This reads on "the encoder adds the beacon information and the phase information to the light".

Regarding **claim 9,** figure 3 discloses the light source modulator encoding the angular direction based on the stepping motor 31 position that is synchronized to a reference 37. This reads on "the rotation driving part outputs information on a phase shift of the transmitting part relative to a reference direction in accordance with the rotation of the rotation driving part."

Regarding **claim 10**, figure 3 illustrates that other light beacons (Nos 2, 3, 4 etc.) can be utilized which reads on "the robot system further comprises: a plurality of beacons".

Regarding **claim 11**, figure 3 illustrates that each beacon incorporates a light source modulator 33 that combines beacon identification (shown incoming from outside the figure and called - pre-set map reference) with the annular direction of the light (as encoded by the gray code disc 32, the line labeled - position feedback). This reads on "wherein the encoder encodes or modulates beacon information of the plurality of beacons with the phase information to the light".

Regarding **claim 15**, figure 3 illustrates that each modulator receives a pre-set map reference of its beacon, which reads on "wherein each of the plurality of beacons have different inherent beacon information".

Regarding **claims 16-18**, Halsall discloses in col. 1, lines 55-57, using a plurality of stations each identifying themselves to the detectors of the vehicle, which reads on "a plurality of beacons" "wherein each of the plurality of beacons have different inherent beacon information". In col. 1, lines 44-47, Halsall discloses that each station emits light that carries its own message concerning the direction of its beam with respect to a fixed axis, which reads on "at least one transmitter provided to **each of the plurality of beacons** to transmit light to determine location of the mobile robot". In col.1 lines 20-23, Halsall discloses at least three light sensitive detectors mounted on the vehicle, each detector adapted to receive omni directional light signals from the at least one fixed station, which reads on "at least one receiver provided to the mobile robot to receive the light transmitted via the at least one transmitter". In figure 3, the motor drive control 34 and stepping motor 31 read on "a rotation driving part to rotate the at least one transmitter". The light source modulator 33 that combines beacon identification with

the annular direction of the light (as encoded by the gray code disc 32, the line labeled - position feedback) reads on "an encoder to add phase information regarding rotation of the at least one transmitter with respect to a reference direction to the light". In figure 4 and col. 6 line 62 to col. 7 line 8, Halsall describes calculating the position of the vehicle, which reads on "a location determiner to determine a location of the mobile robot based on the phase information of the light received by the at least one receiver".

Regarding **claims 17 and 18**, in col. 1 lines 55 to 57 and col. 2 lines 43-48, Halsall discloses that when there are a plurality of stations, each identifies itself to the detectors. This reads on "each of the plurality of beacons has different inherent beacon information." Further Halsall discloses that the vehicle can distinguish between the light from different stations, which reads on "the mobile robot determines the source of received phase information, and calculates a location on the mobile robot."

Regarding **claims 19 and 20**, figure 3 shows that the beacon has a rotating collimated light source 29, a motor drive control and stepping motor, 34, 31 and a light source modulator 33 that read on "a transmitting part to transmit the light to determine the location; a rotation driving part to rotate the transmitting part; and an encoder to add phase information regarding rotation of the transmitting part." Further the rotating collimated light source 29 is rotated via the coupling shaft by the motor drive control 34, which reads on "at least one transmitter rotated by the rotation driving part."

Regarding **claim 23,** figure 3 shows the light source modulator 33 adding the pre-set map reference for beacon 1 and the gray code disc output 32 to the rotating light

source 29 which reads on "the transmitting part has inherent information, and the encoder adds the beacon information and the phase information to the light".

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 3, 5, 8, 9, 12, and 19 – 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Price et al. U. S. Patent No. 3,687,556 (hereafter referenced as Price) in view of Bischoff et al. European Application No. 91-120,176.2.

Regarding **Claim 1,** Price describes a position determining system utilizing a stationary beacon and a receiver on a moving vehicle. Figure 1A shows a beam source, which reads on "a beacon". The beacon is a continuously rotating transmitter device for generating a beam signal. In figure 2, the device for creating the beam is shown with its rotating platform 18, which reads on "a rotation driving part to rotate the transmitting part". At col. 4, lines 40-46 and lines 52-55, it is described how the frequency or the phase of the beam may be modulated to indicate the angular position of the beam, which reads on "an encoder to add phase information regarding rotation of the transmitting part to the light". Price describes monitoring the signal at a receiving station with a pair of signal receiving members spaced apart. Price calculates the range and distance of the receiving station from the beacon based on the information in the signal. In col. 2, lines 10-14, Price describes receiving the beam at a receiving station 35 and relying on the beam modulation to determine the range and distance from the beacon. Price differs from the claim 1 in that there is no mobile robot supporting the receivers,

and Price does not include a processor to compute the location. Bischoff describes a robot for monitoring for abnormal conditions. The robot does not incorporate a means to determine position relative to a known location. It would have been obvious to one of ordinary skill in the art at the time of the invention to add beam receivers of Price to Bischoff's robot and to use the computer in Bischoff's robot to determine the position of a robot. This would provide an inexpensive location determining method so that reports of abnormal conditions can include the location within the monitored area. The modified reference would read on "the mobile robot comprising: a location determiner to determine a location of the mobile robot based on the phase information of the light received by the receiving part".

Regarding **claim 3**, figure 2 illustrates the transmitting part 35. It shows incident light 19 that has been encoded with the angular information hitting an inclined mirror 22 and being transmitted through lens 23. This reads on "the transmitting part further comprising: a mirror disposed at an incline with respect to a horizontal direction; and a transmitter to emit the light at a predetermined incident angle; wherein: the rotation driving part rotates the mirror". While the driving motor is not shown in Price, the shaft 29 is indicated as rotating and at col. 3 lines 42-46 Price describes a rotating laser source as the source of the light. And at col. 4 lines 41-46 the encoding of angular information into phase modulation is described, which reads on "the encoder adds the phase information regarding rotation of the mirror to the light".

Regarding **claim 5**, figure 1A shows a first detector and a second detector at the receiving position. Price's receiver is further illustrated in figure 4, where receiving

elements 11 and 12 are illustrated. It would have been obvious to one of ordinary skill in the art at the time of the invention to place these elements on the mobile robot to allow it to determine its location. The modified reference reads on "the receiving part further comprising: at least one receiver to receive the light transmitted from the transmitting part".

Regarding **claim 8**, figure 1A illustrates determining the location of the ship using the encoded light received at a position 1 and then using the encoded light received at a position 2. When the Price receivers are integrated with Bischof's robot as described above, the robot can take readings as it moved between two positions. This reads on "the location determiner determines the location of the mobile robot based on the displacement of the mobile robot, and the phase information received by the receiving part".

Regarding **claim 9**, at col 4, lines 46-55, Price describes the phase starting to increase as the beam passes a fixed geographical reference and increasing in a linear manner for a full rotation of the beam. When the beam returns to the reference location, the phase returns to the original value and therefore the phase is proportional to the direction with respect to a fixed geographical reference. This reads on "the encoder part (Examiner's correction to the claim) outputs information on a phase shift of the transmitting part relative to a reference direction in accordance with the rotation of the rotation driving part".

Regarding **claim 12**, figure 2 illustrates the transmitting part 35. It shows incident light 19 that has been encoded with the angular information hitting an inclined mirror 22

and being transmitted through lens 23. This reads on "the beacon further comprising: a single sided mirror to reflect an incident light from the transmitting part at a predetermined angle".

Regarding **claim 19**, Price illustrates the beacon using figure 2. The light 19 entering the transmitter 35 is described in col. 4 lines 40-46 and 52-55 as being encoded with phase modulation regarding the rotation of the beacon. This reads on "an encoder to add phase information regarding rotation of the transmitting part". Col 2, lines 1-4 describes a continuously and uniformly rotating modulated fan-shaped beam that reads on "a transmitting part to transmit the light to determine the location". Further, at col. 3, lines 42-46 the rotation of the light is described. This reads on "a rotation driving part to rotate the transmitting part".

Regarding **claim 20**, figure 2 shows the incident light 19 being transmitted using lens 23. The lens is positioned on the rotating platform 18. This reads on "at least one transmitter rotated by the rotation driving part".

Regarding **claim 21**, figure 2 shows an inclined mirror 22 that reads on " a mirror disposed at an incline with respect to a horizontal direction". Light 19 enters through aperture 20 and strikes the mirror 22 at a determined angle, which reads on "a transmitter to emit the light at a predetermined incident angle". The shaft 29 rotates the base plate 18 on which the mirror is mounted, which reads on "wherein the rotation driving part rotates the mirror". The encoding of the phase information onto the light is described in col. 4, lines 40-46 and 52-55. This reads on "the encoder adds the phase information regarding rotation of the mirror to the light".

Claims 6 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Halsall in view of Rocks U.S. Patent No. 5,974,348 (hereafter referenced as Rocks). Rocks, like Halsall is directed to of self-propelled autonomous robots determining their location. Halsall teaches that the error is minimized when the detectors receive light simultaneously.

Regarding **claim 6**, while Halsall, as discussed above, discloses a roving automatic vehicle guided by on-board light sensitive detectors, it does not show "the receiving part further comprising: a conical mirror to reflect light from various directions towards one direction; and a receiver to receive the light reflected from the conical mirror". Rocks at col. 9., lines 35-40 discloses using a panoramic image collector 210 which may be a conical reflector, which reads on "conical mirror to reflect light from various directions towards one direction" to reflect light beams from the beacons to an imaging camera 324, which reads on "a receiver to receive the light reflected from the conical mirror". It would have been obvious to one of ordinary skill in the art at the time of the invention to add the conical mirror to Halsall's receivers to increase the simultaneity of the received light.

Regarding **claim 14**, Halsall does not show "a conical mirror to concentrate light transmitted". Rocks at col. 9, lines 35-40 discloses using a panoramic image collector 210 which may be a conical reflector to reflect light beams from the beacons. Further in figure 6A, Rocks shows the light from all directions being directed through a common point 630. This reads on "a conical mirror to concentrate light transmitted". It would

have been obvious to one of ordinary skill in the art at the time of the invention to add the conical mirror to Halsall's receivers to increase the simultaneity of the received light.

Allowable Subject Matter

Claims 2, 4, and 22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 13 would be allowable if rewritten to overcome the rejection under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Claim 2 recites more than one transmitter, sending light encoded with phase information regarding the rotation, spaced apart from each other and rotated by the rotation driving part. This combination was not taught or suggested by the prior art.

Claim 4, 13 and 22 recite that the transmitting part emits light toward the double sides of the mirror in the beacon. Use of a double-sided mirror was not taught or suggested in the prior art.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Elwood, U.S. Patent No. 3,613,095 for a position locating system

using single path signal transmissions. Alderman, U.S. Patent No. 4,268,167 for use of two transmitted beams. Halsall et al., U.S. Patent No. 4,328,545 for use of either active or reflective sources in navigation. Dyke, U.S. Patent No. 4,700,301 for use of geometric calculation in position determination. Ake, U.S. Patent No. 5,000,564 for laser modulated with angular information and a receiver that determines location. Friedland, U.S. Patent No. 5,243,397 for use of two transmitted beams from same rotation platform. Milani et al., U.S. Patent No. 5,715,042 for two beacons in two positions. Kasper et al., U.S. Patent No. 7,110,092 for position determination by time resolution between two transmitters.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lin B. Olsen whose telephone number is 571-272-9754. The examiner can normally be reached on M-F, 7:30am-5:00pm EST, Alternate Fri. off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian T. Pendleton can be reached on 571-272-7527. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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